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National
Qualifications
2022

Mark

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X826/76/01

**Environmental Science
Paper 1**

TUESDAY, 31 MAY

9:00 AM – 9:45 AM



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Fill in these boxes and read what is printed below.

Full name of centre

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Scottish candidate number

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Total marks — 20

Attempt ALL questions.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers and rough work is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting. Any rough work must be written in this booklet. You should score through your rough work when you have written your final copy.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



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Total marks — 20
Attempt ALL questions

Brownfield sites are being prioritised for development, especially in heavily populated or industrialised areas. Brownfield sites are disused areas that were previously used for industrial, commercial, or residential purposes.

A company is proposing to develop a theme park complex on a brownfield site. The site is a 500-hectare peninsula that extends out into a major river estuary. The estuary lies in a major urban and economic growth area. It is dominated by industrial developments, docks, and communication routes.

A coal-fired power station, a landfill site, cement works, and a sewage plant have all been present on the peninsula in the past. The infrastructure from these industries has mostly been removed and vegetation and wildlife have returned to the area.

The coastal edge of the peninsula includes one of the largest areas of marsh along the river. It is part of a chain of marshes extending around 80 km towards the sea. The marshes form one of the most nationally and internationally important habitats for over-wintering birds. These marshes act as natural flood defences, protecting nearby urban areas from increases in water level caused by storms and extreme high tides.

The company has put forward two proposals for consultation:

Option 1: construction of the complex on part of the brownfield land. The complex will be surrounded by security fencing, which will be screened with trees. The remaining land will be tidied up and public walkways installed or replaced, but largely left as marsh.

Option 2: full development of the peninsula, with security fencing and screening trees. The marshland will be drained. The complex will be surrounded by a park that includes managed grassland, ornamental lakes, flower beds, and picnic areas. Visitors will pay a separate entry fee to use the park.

Using the information provided in the supplementary source booklet and your knowledge of environmental science, answer the following questions.



1. The brownfield site is known to be polluted from its past uses.
- (a) Part of the brownfield site was used for landfill. Landfill releases a mixture of gases.
- (i) Name a gas released from landfill sites that enhances the greenhouse effect. 1
- (ii) Landfill gas can be collected and used as a fuel source.
Suggest why landfill gas could be considered to be a 'green' fuel source. 1
- (b) When the coal-fired power station was in use, ash waste was dumped nearby. The landscape in these areas now includes mounds of ash and water-filled lagoons.
- (i) Suggest an impact that the mineral-rich ash waste would have on the soil. 1
- (ii) Despite high levels of pollution, the brownfield site has a high level of biodiversity, including some rare and endangered species.
Suggest why a high level of biodiversity can be found in this area. 1



2. Climate modelling predicts that local sea level will rise between 20 cm and 90 cm by 2100.

MARKS DO NOT WRITE IN THIS MARGIN

Suggest which of the two options proposed by the development company would be the most able to withstand the impacts of rising sea level.

Justify your answer.

1

3. Consultants carried out an opinion poll in nearby towns. Individuals from different age groups were selected at random and questioned about their experience of other theme parks.

(a) Identify the type of random sampling used in the opinion poll.

1

- (b) It is forecast that up to 40 000 people per day will visit the complex at peak periods. Using data from other theme parks, financial analysts have forecast that 59% of visitors to the complex will be full paying adults, 38% will pay a child rate, and the remainder will qualify as concessions.

The table shows typical one-day entry prices to a theme park.

Visitor category	Ticket price (£)
Adult (12+ years)	35
Child (3–11 years)	25
Concession	0

Using these entry prices, ticket revenue from children would be expected to generate £380,000 per day during peak periods.

Using the information provided, calculate the total projected ticket revenue that the complex would generate in one day during peak periods.

2

Space for working



3. (continued)

- (c) As part of the opinion poll, individuals were asked to state the maximum price they would be willing to pay for entry to a theme park. The table shows the mean maximum entry price by age group.

Age group (years)	Mean maximum entry price (£)
18–25	31
26–29	46
30–34	48
35–39	42
40–44	36
45–49	30
50–54	27
55–60	29
Over 60	23

The interquartile range (IQR) can be used to measure the spread of data. The company will consider the outcome when setting entry prices to the complex.

Using the data in the table, calculate the IQR for these data.

2

Space for working



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3. (continued)

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- (d) The company will encourage visitors to use public transport by offering combined travel and entry tickets at reduced prices.
Explain why this may still have a negative environmental impact.

2

4. The proposed development plan states that construction materials will be shipped into and stored at port facilities on the opposite side of the river. They will then be transported by boat to the existing quay located close to the development site.
Explain a possible impact this method of managing construction materials could have on the local environment.

2

5. Opponents of the proposed development argue that the forecasted creation of around 33 000 jobs is misleading to the public.
Suggest why this might be the case.

1



6. There are three possible options for the brownfield site.

Using evidence from the sources and your knowledge of environmental science, decide which **one** of the options should be adopted for this site.

Justify your answer.

5

- Partial development (Option 1)
- Full development (Option 2)
- No development

[END OF QUESTION PAPER]



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ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK



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